

**TITLE**

**LONG-PISTON HYDRAULIC MACHINES**

**ABSTRACT**

Smaller and lighter hydraulic pump/motors provide remarkably improved volumetric efficiency with pistons having body portions substantially as long as the axial length of the respective cylinders in which they reciprocate. A plurality of respective lubricating channels, formed circumferentially and radially transecting the walls of each cylinder, are each positioned to be almost completely closed at all times by the axial cylindrical body of each respective piston during its entire stroke. Each lubricating channel is interconnected, one to another, to form a single, continuous lubricating passageway entirely within the cylinder block and not connected by either fluid "input" or fluid "output" passageways, being replenished solely by a minimal flow of fluid entering from the valve end of each cylinder and passing between each respective cylindrical wall of each cylinder and the axial cylindrical body of each respective piston. Several embodiments are disclosed in combination with various spring-biased hold-down assemblies.